Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of	**)**	
	)	
Amendment of Rules Governing Ultra-Wideband	**)**	**RM -11844**
Devices and Systems	**)**	

To: The Chief
Office of Engineering and Technology
Via: ECFS

COMMENTS OF ROBERT BOSCH LLC

Robert Bosch LLC (Bosch), petitioner in the captioned proceeding,[1] by counsel and pursuant to Section 1.405 of the Commission's Rules (47 C.F.R. § 1.405), hereby respectfully submits these comments and its statement of continuing support for the above-referenced Petition. The Bosch Petition requests that the Commission initiate a comprehensive review of the Part 15, Subpart F regulations governing Ultra-Wideband (UWB) devices and systems, and asks that the Commission adopt modified rules for UWB operation as proposed in the Appendix to the Petition regarding UWB devices and systems. In continuing support for its Petition, and to address some additional aspects of the proposal, Bosch states as follows:

1. Bosch continues to urge the adoption of the proposed modified rules that will facilitate the development and provision of new, innovative UWB products in the United States marketplace by manufacturers. Many such products and systems which would be useful in the United States are not permitted by the current UWB rules, due to the initial regulatory

[1] The Bosch Petition was placed on *Public Notice* by the Consumer and Government Affairs Bureau Reference Information Center on July 18, 2019 (see Report No. 3130). That *Public Notice* announced a 30-day comment period ending August 17, a Saturday. Pursuant to Section 1.4(j) of the Commission's rules, these Comments are timely filed on Monday, August 19, 2019.

environment, adopted for this technology by the Commission seventeen years ago. The current regulatory environment for UWB products is indeed highly restrictive. Most such products, in order to be eligible for a grant of equipment authorization, require waivers of multiple sections of the Subpart F, Part 15 rules.

2. Manufacturers that can configure their products and systems to operate in the band 5925-7250 MHz can utilize Section 15.250. That rule section is contained among the *Radiated Emission Limits and Additional Provisions* segment of Subpart C of Part 15. It permits operation of wideband digital systems within that frequency range and is in some respects more flexible than are the Subpart F rules governing UWB devices.[2] That provision, however, is limited to certain use cases. Section 15.250 prohibits, *inter alia,* all fixed outdoor infrastructure; any aeronautical applications; and some consumer products. Additionally, the band 5925-7125 MHz is now proposed in ET Docket 18-295 to accommodate ubiquitous, unlicensed mobile broadband facilities without any inherent protections for incumbent UWB or other incumbent wideband devices and systems in the same band. Finally, Section 15.250 applies the same testing procedure to devices subject to that Section as are applicable to UWB devices, relative to compliance with the minimum bandwidth definition in Subpart F of the Rules. This requirement necessitates waivers for UWB products configured for Section 15.250 as well as those which operate under Subpart F. Though some UWB device manufacturers can, by virtue of Section 15.250, avoid the Subpart F rules proposed to be modified hereunder and obviate the need for a rule waiver, that rule section is insufficient to accommodate current and future development of UWB technology

[2] For example, §15.250 does not contain provisions calling for a manually operated switch that causes the transmitter to cease operation within 10 seconds of being released by the operator, as do the Subpart F rules relative to ground penetrating radars and wall imaging systems. The reason for the regulatory distinction is unclear and unexplained.

in the United States. It is not a substitute for revision of the Subpart F UWB rules proposed in the Bosch Petition.

3. Generally, the Bosch Petition notes that the UWB rules, first adopted in 2002, which the Commission referred to as "very conservative" at the time, have not been modified since their adoption, though the Commission indicated at the time an intention to revisit those rules early on, after some experience had been obtained. From that time to the present day, Bosch has not found any documented cases of interference from a UWB device to either narrowband or wideband allocated radio services. The definitional rules in Subpart F of Part 15 limit applications for UWB technology, and they limit the modulation schemes that can be deployed, without reference to interference potential. These regulatory limitations have a preclusive effect on devices of great utility in a variety of industries. Worse, the limitations actually encourage the development of devices and systems that use more bandwidth than is operationally necessary, or transmitters that inject noise, in order to increase the occupied bandwidth of a signal exclusively for the purpose of meeting the strict definitional regulation.

4. Definitions limiting, for example, "imaging systems" and "surveillance systems" should be revised and additional use cases permitted. These should include radiolocation and communications systems using fixed infrastructure, and certain outdoor mobile and fixed radio determination applications such as motion sensors and perimeter protection systems. UWB applications could include ranging, tracking, and object classification, and the technology offers significant potential improvements in home automation and energy efficiency.

5. The Bosch Petition would have no adverse impact on current or future Commission plans to enable wider deployment of unlicensed broadband services and systems. UWB devices operate with very low radiation levels and low power spectral densities, and this results in

significant opportunities for spectrum sharing through UWB overlays and underlays, due to the availability of numerous active and passive compatibility techniques such as detect and avoid before transmit protocols, limited duty cycles, limited radiation patterns and beam tilt requirements. UWB devices operating at the -41 dBm/MHz power density level will predictably not interfere with broadband systems, in the bands below 10 GHz or otherwise. Worldwide, there are variations in the transmitter power permitted for UWB devices, but the maximum EIRP permitted in the United States, -41.3 dBm/MHz, is quite uniform throughout the world. This is the maximum limit for *unintended radiation* from a non-UWB RF device. Therefore, UWB transmissions have been historically limited to the level of background noise, which is well below the interference threshold of other incumbents, including broadband systems. There is a significant signal to interference ratio that effectively ensures that there would be no interference from UWB systems to either narrowband or broadband systems operating in the same spectrum. That characteristic would apply even if the power limit for UWB devices was increased by as much as 10 dB. Therefore, if as proposed, the Commission should decide to permit unlicensed broadband devices and systems in the band 5925-7125 MHz, there should be no interference from incumbent and future UWB systems operating in the 3.1-10.6 GHz band.

6. The converse is not necessarily true. Given the low transmitted power level currently allowed for UWB systems, which is typically much lower than for narrowband or broadband transmitters, a scenario with strong narrowband or broadband interferers producing very small signal-to-interference ratios at the UWB receiver is not unlikely. It is noteworthy that the spurious requirement for unlicensed narrowband and broadband systems is less stringent than the wanted emissions from a UWB device. For narrowband/wideband short range unlicensed devices, the spurious limit is at or below -30dBM/MHz. With respect to wideband WiFi systems

with occupied bandwidths of 80 MHz or more, the interference potential to radio services is not different from UWB in the same range. Typically radio service receiver passbands are less than 80 MHz, and therefore there are no differences between UWB and wideband in terms of interference potential.

7. Though there is an inherent robustness of UWB systems relative to narrowband interference, it may not be sufficient in some situations to allow UWB devices to avoid interference from overlay broadband systems. This should not be an issue, however, inasmuch as all UWB devices are subject to Section 15.5 of the Commission's rules (applicable to all Part 15 devices and systems), which states unequivocally, *inter alia,* that users of all UWB devices "shall not be deemed to have any vested or recognizable right to continued use of any given frequency by virtue of prior registration or certification of equipment..." and that operation of a (UWB device) is subject to the conditions that no harmful interference is caused and that interference must be accepted that may be caused by the operation of an authorized radio station, by another intentional or unintentional radiator, by industrial, scientific and medical (ISM) equipment, or by an incidental radiator." Given the regulatory status of UWB devices and systems, and the fact that interference from UWB equipment to narrowband or broadband systems is highly unlikely makes the relief sought in the Bosch Petition independent of, and irrelevant to any decision that the Commission might make with respect to the band 5.925-7.125 GHz in pending ET Docket 18-295.

8. Relative to the robustness of UWB systems and their performance in the presence of higher power narrowband signals, it should be noted that the Bosch Petition seeks (1) to modify the means by which the minimum bandwidth requirement is realized by elimination of the requirement that UWB devices meet the minimum requirement "at any point in time" in the

device's operating cycle; and (2) a power increase of 10 dB for UWB indoor operation. If these provisions are enacted, the UWB physical layer could be used for wideband communications (WiMAX). A more flexible regulatory scheme would allow better coexistence between and among all UWB devices without increasing interference potential to incumbent narrowband and broadband systems.

Therefore, the foregoing considered, Robert Bosch LLC respectfully again requests that the Commission review and modify the UWB rules under Part 15, Subpart F as set forth in the Bosch Petition for Rule Making and in the Appendix thereto, by means of a Notice of Proposed Rule Making issued at an early date.

Respectfully submitted,

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